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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/651,526	08/29/2003	Yoshiharu Shirakawabe	S004-5110	8868

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EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 12/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/651,526

Applicant(s)

SHIRAKAWABE ET AL.

Examiner

Rodney G. McDonald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address.

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 September 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 19-53 is/are pending in the application.
- 4a) Of the above claim(s) 26-53 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 19 and 22-25 is/are rejected.
- 7) ☒ Claim(s) 20 and 21 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restrictions***

On September 29, 2004 Applicant provisionally elected the method (claims 19-41) of the invention and elected the species method of utilizing a focused charged particle beam in conjunction with etching or sputtering for examination. Applicant was attempting to correct the Examiner error in which the preliminary amendment of June 23, 2004 was not taken into consideration for the Restriction requirement.

The Examiner appreciates Applicant's effort in this matter. However the Examiner has redone the Restriction requirement as set forth below. It should be noted that the method claims have been separated into three groups (I-III). The Examiner has examined group I based on the consideration that Applicant elected the method of utilizing a focused charged particle beam in conjunction with etching or sputtering for examination on September 29, 2004. The other groups of claims have been withdrawn for consideration but the election will be treated as an election with traverse. If Applicant feels that the restriction is improper or as to why groups II and III should be examined with group I Applicant is invited to present reasons in the next Office Action for consideration.

### ***Election/Restrictions***

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 19-25, drawn to a method of manufacturing a multi-tip probe comprising a step of forming the plurality of electrodes utilizing a focused charged particle beam, classified in class 204, subclass 192.32.

- II. Claims 26-32, drawn to a method of manufacturing a multi-tip probe comprising a step of forming the plurality of conductive electrodes by ion implantation, classified in class 427, subclass 523.
- III. Claims 33-41, drawn to a method of manufacturing a multi-tip probe comprising a step of forming a plurality of conductive electrodes by a photolithographic technique, classified in class 430, subclass 320.
- IV. Claims 42-49, drawn to a surface characteristic analysis device, classified in class 73, subclass 105.
- V. Claims 50-53, drawn to a multi-tip probe, classified in class 250, subclass 306.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions have different modes of operation in that the forming of the plurality of electrodes occurs by different processes.

Inventions I and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions in that the forming of the plurality of electrodes occurs by different processes.

Inventions I and IV are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process can be used to make probes for non-AFM systems, such as scanning tunneling microscopy or other non-AFM technique.

Inventions I and V are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process can be used to make probes having other values of pith between the electrodes.

Inventions II and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions in that the forming of the plurality of electrodes occurs by different processes.

Inventions II and IV are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process

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(MPEP § 806.05(f)). In the instant case the process can be used to make probes for non-AFM systems, such as scanning tunneling microscopy or other non-AFM technique.

Inventions II and V are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process can be used to make probes having other values of pith between the electrodes.

Inventions III and IV are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process can be used to make probes for non-AFM systems, such as scanning tunneling microscopy or other non-AFM technique.

Inventions III and V are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process can be used to make probes having other values of pith between the electrodes.

Inventions IV and V are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because invention IV does not require any specific path between electrodes. The subcombination has separate utility such as a probe for a scanning tunneling microscope or other non-AFM technique.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 19 and 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masahiro et al. (Japan 09-127139) in view of Hantschel et al. (U.S. Pat. 6,668,628).

Regarding Applicant's claim 19, Masahiro et al. teach forming a minute probe by forming **a cantilever** by patterning to form the cantilever and then forming near the free end of the cantilever a minute needle-shaped projection by continuously irradiating the cantilever with a low energy **focused ion beam** under a vacuum condition to evaporatedly form the projection. (See Abstract) **Photolithography can be utilized to form the cantilever.** (See Machine translation paragraph 0021) The probe tip can be formed of metals or semiconductors. (See Abstract)

With regard to the step of forming a needle shaped probe on the distal end of each electrode by chemical vapor deposition using a focus ion beam device of Applicant's claim 23, the electrode is formed with a focused ion beam and then a focus ion beam is used for milling the deposited electrode to form a tip. (See Machine translation paragraph 0037) The electrode material is deposited by vapor deposition. (See Machine translation paragraph 0012)

With regard to the step of forming the cantilever to have a convex portion and forming the plurality of electrodes on the convex portion of Applicant's claims 25, Masahiro et al. teach forming the convex portion and then forming the minute needlelike projection 3. (See Machine translation paragraph 0034)



The differences between Masahiro et al. and the present claims is that forming a plurality of minute probe tips as electrodes is not discussed on the cantilever is not discussed (Claim 19), the spacing between the electrodes is not discussed (Claim 22) and the step of forming the probe with a curved structure is not discussed (Claim 24).

Hantschel et al. teach utilizing scanning probe systems, which include scanning probe microscopes (SPMs), atomic force microscope (AFMs), or profilometers that use **cantilevered** spring (e.g. stressy metal) **probes** formed on transparent substrates. (See Abstract)

With regard to the plurality of electrode probe tips of Applicant's claim 19, Hantschel et al. teach in Figs. 11(A) and 11(B) top and cross-sectional side views showing a partially formed multi-probe assembly 120-11 according to yet another embodiment of the present invention. **Multi-probe assembly 120-11 includes several parallel thin metal wires** 1130 formed on an insulating layer 1140, which in turn is formed on spring material island 520. Insulating layer 1140 prevents measurements using multi-probe assembly 120-11. (Column 13 lines 10-18) **(The examiner understands the metal wires to be electrodes)** Figs. 14(A) through 14(E) are photographs showing **two- and four-tip probe assemblies**. (Column 14 lines 20-25)

With regard to the spacing between electrodes of Applicant's claim 22, as indicated in Figures 14(A) through 14(E), these probe assemblies are formed with minimal spacing (e.g., 6 micrometers or less) between adjacent probe tips. (Column 14 lines 20-25)

With regard to the step of forming the probe with a curved structure of Applicant's claim 24, Hantschel et al. teach that the cantilever be curved. (Column 11 lines 3-7)

***Allowable Subject Matter***

Claims 20 and 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Claim 20 is indicated as being allowable over the prior art of record because the prior art of record does not teach the steps of forming a plurality of lead portions by lithography at a base portion of the cantilever, forming a conductive shunt area at a distal end of the cantilever, and forming electrodes at the shunt area by sputtering or gas-assisted etching of the conductive distal end of the cantilever using a focused charged particle beam.

Claim 21 is indicated as being allowable over the prior art of record because the prior art of record does not teach the steps of forming a plurality of lead portions by lithography at a base portion of the cantilever, and forming a plurality of electrodes at the distal end of the cantilever by irradiating the distal end of the cantilever with a focused charged particle beam while blowing a source gas toward the distal end.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rodney G. McDonald  
Primary Examiner  
Art Unit 1753

RM  
December 6, 2004